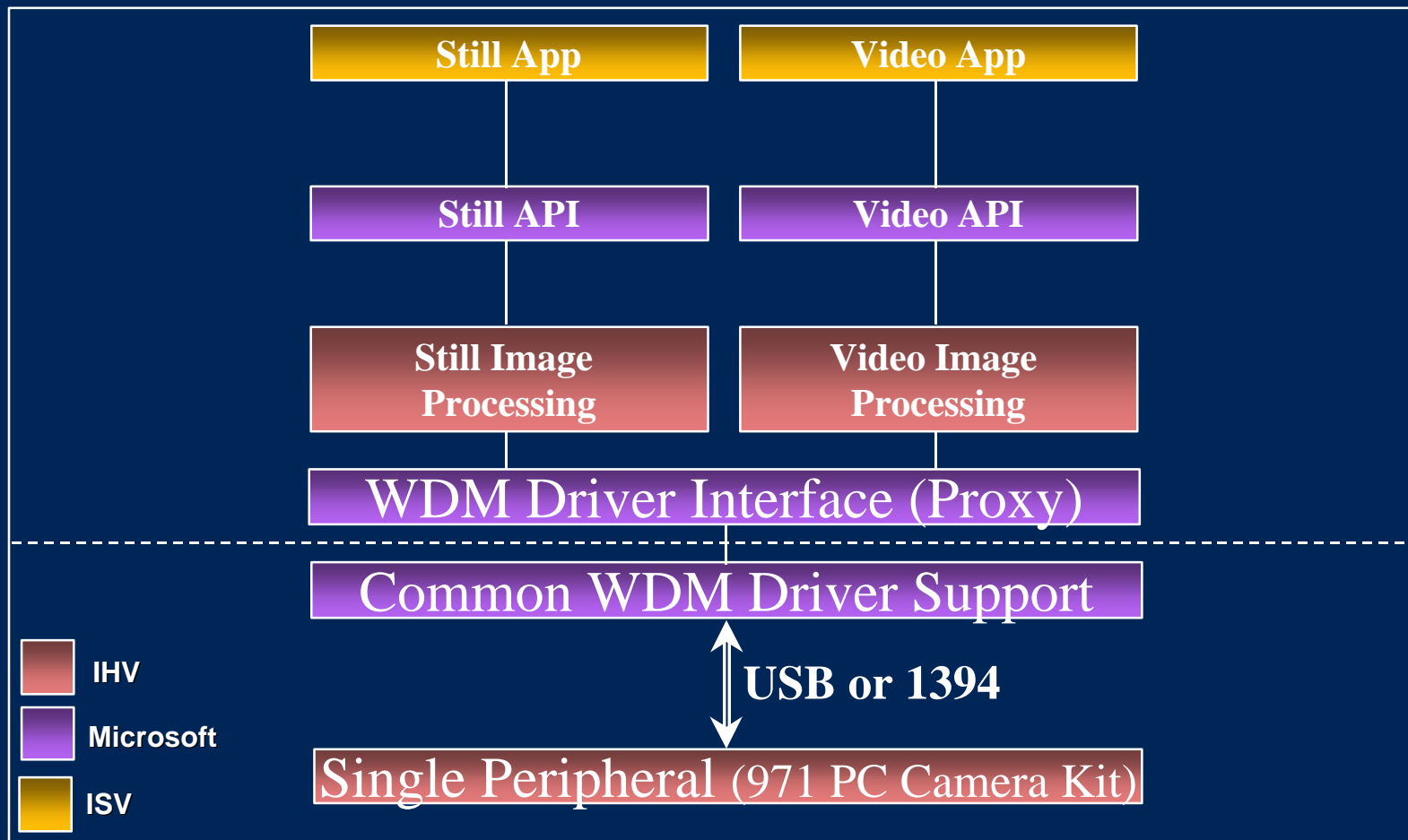


# **WDM Drivers for Dual Mode PC Cameras**

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# S/W Architecture of a Dual Mode PC Camera



# Win 98 Demo

I would like to demonstrate the capabilities of a camera manufactured by Samsung based on Intel's 971 PC Camera Kit reference design. Other camera providers like Polaroid and Lite-On are also ramping up to produce cameras based on the 971 Kit.

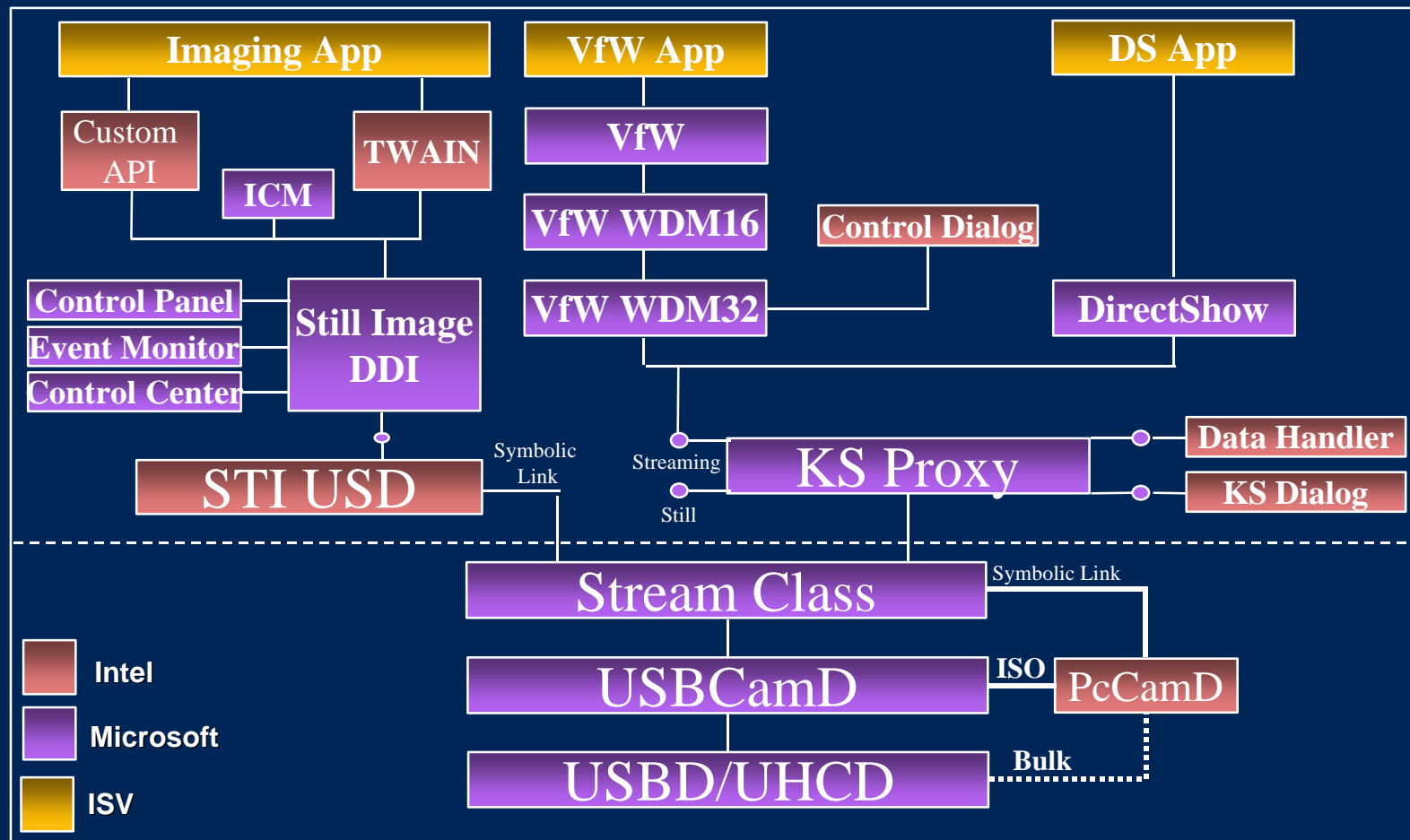
I am connecting the camera to USB port of the PC.

**Win98** still image architecture recognizes the camera and the push model launches the application associated with the event.

As soon as the application is launched the images are automatically downloaded without any user interaction. These thumbnails are actually complete images. Unlike other cameras that require another download for the full image, this camera software allows you to work with the images immediately.

Now you are ready to save images into standard file formats like FlashPix. You can copy to the clipboard or view a full image. also, you can drag and drop into popular imaging applications like Microsoft Picture It.

# Current Implementation of 971 PC Camera Kit



# WDM-Streaming Implementation

- ◆ Dual-mode logic performed in PcCamD (kernel mode mini driver)
- ◆ USBCamD for ISO transfers
- ◆ Image processing performed in kernel mode (PcCamD) to support VfW
- ◆ Real Time MMX™ Technology optimized code runs at passive level
- ◆ “Hybrid” command states maintained

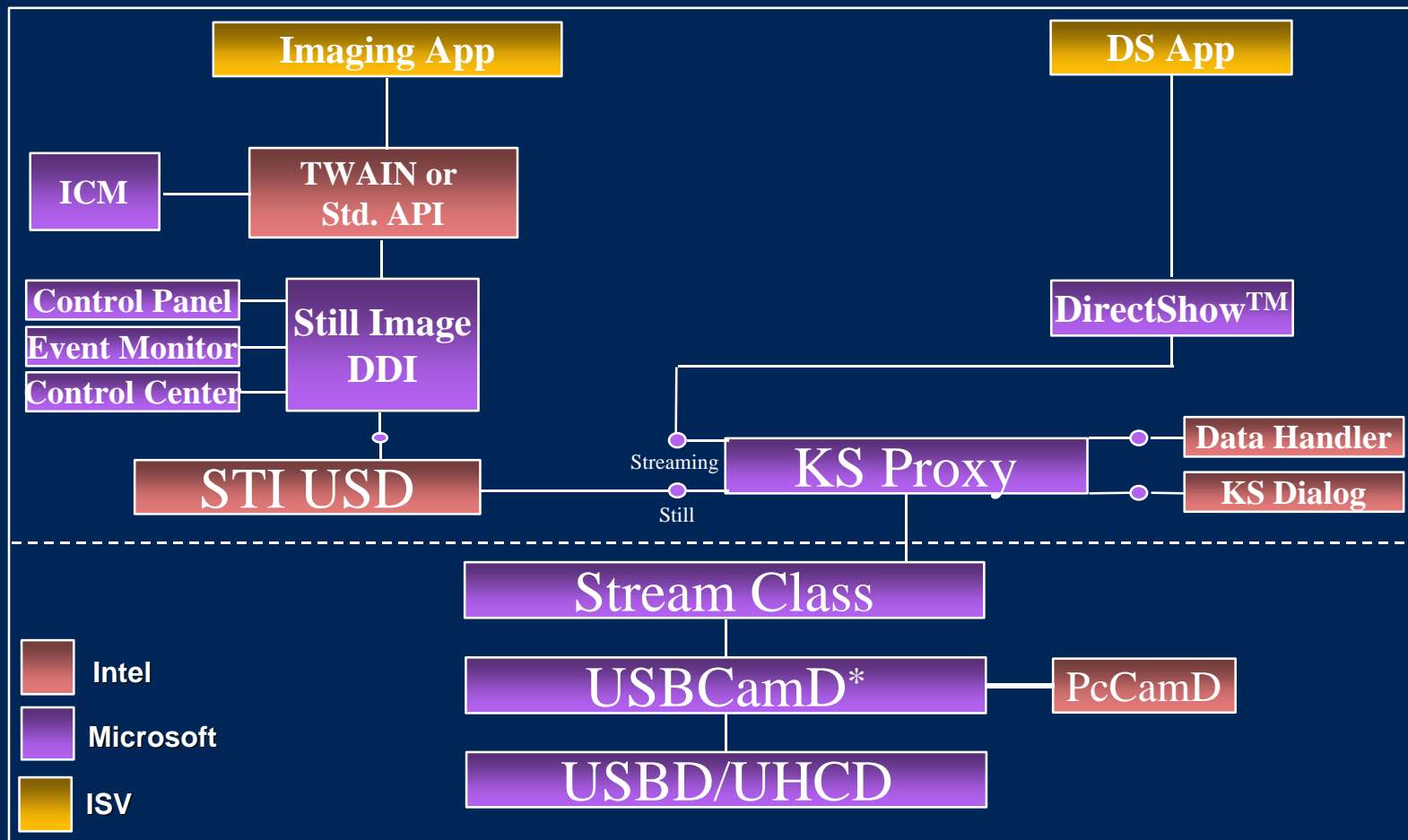
# WDM-Still Implementation

- ◆ USBScan or USBCamD can be used
  - ◆ No native support for stills in Stream Class Drivers
- ◆ Implementation requires:
  - ◆ STI USD opens symbolic link to Stream
  - ◆ STI USD issues IOCTLs to Stream
  - ◆ Still cmds use KS Custom Property set
  - ◆ PcCamD intercepts bulk transfer cmds
  - ◆ Bulk transfers to USB D/UHCD bypass USBCamD

# Enhanced support in OS for Dual Mode PC Cameras

- ◆ Intel working with Microsoft to provide a clean solution for multi-mode devices
- ◆ Enhanced USBCamD provided by Microsoft (Supports ISO & Bulk)
- ◆ Fully functional Still Pin exposed by KS Proxy:
  - ◆ STI USD connects to KS Proxy

# Enhanced support in OS for Dual Mode PC Cameras





# Still Stack Features

- ◆ TWAIN1.7/Custom API
- ◆ System level color mgmt. via ICM
- ◆ Offers Preview & Capture capability
- ◆ 3 Image Sizes: 768x576, 640x480, 320x240
- ◆ Control Panel console to monitor events/diagnose hardware
- ◆ Ultimate “Ease of Use” experience

# Push Model

- ◆ Embodiment of a natural usage scenario
- ◆ Supports both polling and asynchronous driver notification
- ◆ Events can trigger actions such as:
  - ◆ Launch Application
  - ◆ Appropriate actions on button press: Capture Image, Change Resolution, etc..
- ◆ Control Center + Image Monitor (STI components) provide functionality

# Video Stack Features

- ◆ Services offered by KSPProxy
- ◆ VfW and DirectShow interfaces provided
- ◆ Outputs YUV12 format
- ◆ YUV12->sRGB CoDec provided
- ◆ CIF (~10 fps) and QCIF (~20 fps)
- ◆ Controls provided using video source dialog

# KS Proxy

- ◆ WDM streaming filters under DS
- ◆ Exposes the H/W interface through pins: Streaming, Still, Property Set
- ◆ Allows hooking of data handlers for custom interfaces
- ◆ Supports multiple equivalent devices
- ◆ Offers an efficient, more complete and rich streaming interface over VfW

# DirectShow

- ◆ Filter based architecture
- ◆ Performance efficiency - lower latency
  - ◆ Minimizes Ring 3 to Ring 0 transitions
- ◆ Offers generic set of filters
  - ◆ Video Capture, Audio Capture, Preview
  - ◆ Overload filters to modify functionality
- ◆ SDK provides easy to use Filter Graph Editor

# Challenges in Dual Mode

- ◆ Concurrent access to still and streaming
- ◆ Overcome hardware limitations (single image capture/storage buffer, etc..)
- ◆ Atomic still operations
- ◆ Buffer management while changing modes
- ◆ Maintaining “Hybrid” state information

# Call to Action

- ◆ Camera HW connects to PC - why not support both still and video
- ◆ USB Coupled with MMX™ Technology is a compelling interface for Still and Streaming apps
- ◆ 1394 is arriving - plenty of available bandwidth
- ◆ DirectShow offers superior streaming
  - ◆ Abandon VfW

# Reference Information

- ◆ 971 PC Camera Kit Information:
  - ◆ [www.intel.com/imaging](http://www.intel.com/imaging)
- ◆ 971 PC Camera Kit Technical Information:
  - ◆ [www.developer.intel.com/design/imaging](http://www.developer.intel.com/design/imaging)
- ◆ Portable PC Camera '97 Design Guidelines:
  - ◆ [www.developer.intel.com/design/imaging](http://www.developer.intel.com/design/imaging)